

through the deep valleys. By night there is a very gentle land breeze. The trades bring little rain to Honolulu, and the southern slopes of Oahu are arid in comparison with those of the windward side. The winter storms from the southwest, however, make up the needed rainfall.

3. Strong trade wind exposures, at the north and south capes of the islands, as northwest Kohala on Hawaii, Kaupo on Maui, and the south side of Molokai. Here the trades blow uninterruptedly, drearily, endlessly.

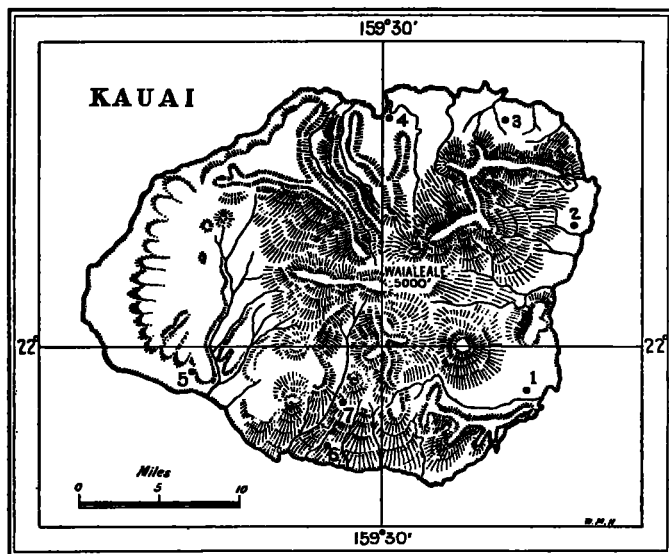


FIG. 5.

No.	Station.	Elevation, feet.	No.	Station.	Elevation, feet.
1.	Lihue	200, 300	5.	Waiawa	32
2.	Kealia	15	6.	Keele	200
3.	Kilauea Plantation	325	7.	Wahiawa Mountain	2,100
4.	Hanalei	10			

4. The region of alternating land and sea breezes, viz, Hilo Bay and its neighborhood. To the north of Hilo Bay the trade wind divides into two streams, one flowing westward over Hamakua, the other southward, and very gently, often not reaching Hilo Bay until about noon. By night a well-marked land breeze flows down from Mauna Kea, lowering the temperature 10° to 15°. Stormy winds from the north occasionally arise, but in Hilo any strong wind is rare; the southwest gales felt on the other islands are seldom known here. The north wind is the stormy wind; it brings heavy rains. "It is, no doubt, the incessant meeting of the warm vapor from seaward with cool masses of air from the mountains (Mauna Kea) that produces the world-renowned precipitation of Hilo, from 100 to 200 inches per year. An engineer told me he had known a sixteen-inch-deep sugar cooler in the open air to be filled in one night."

5. The leeward land and sea breeze district, viz, the greater part of western Hawaii and of southern Maui. In these regions the sea breeze comes in regularly at about 9 a. m., blowing inland; and as regularly, soon after nightfall, comes the land breeze. From Kawahae to northern Kona, or over the northern part of the coast first mentioned, the "mumuku" also prevails, a violent downrush of trade winds across the northern promontory of the island, abolishing all the local currents for the time being.

The trade winds are regarded by the foreign residents as especially healthful. But a trade wind winter is not a healthy season, being abnormal, and "sickness and mortality, especially among native Hawaiians, are greater than when the regular southerly wind is in due proportion. Much as has been said against the hated south wind, nothing affects the native worse than the north or northwesterly wind." (Lyons.)

The "kona" or southerly gales, usually begin in November—rainy, damp, and blustering winds, at a higher temperature and with higher saturation than those just described. For the foreign residents they are often enervating and depressing, yet the saturation for the months of their prevalence is not materially higher than at other times. The first heavy snows on Mauna Kea and Mauna Loa came in early November, and occasionally cover a full half of the height of the mountain, extending as far downward as to the 7,000-foot level; the huge isolated dome of snow, rising in unobstructed splendor far above the tropic forests, is a spectacle of great sublimity. The top of Mauna Kea is almost exactly on the line of perpetual snow. The entire disappearance of the névé from the summits, as seen from below, is rare; and it is probable that the snow never entirely melts away. I have been on the summit of the mountain in July, and have seen large masses of frozen snow lying in the channels and wrinkles of the terminal cones, in spots where it could not be visible from the coast. But the question of its permanence could be settled only by establishing an observatory on the dome of the mountain; this could be built and maintained at no very great expense, and it would

yield data of the highest value, especially in regard to the upper wind currents.

The cumulus clouds are the trade wind clouds; their lower limit in ordinary weather may be 2,800 feet; their upper limit, 8,000 feet. Above this air stream a ceaseless current flows from the northwest, bearing the cirrus clouds, in secular and uninterrupted march, at a height of from 10,000 to 25,000 feet. "During the eruptions of Mauna Loa the column of mineral smoke rises perpendicularly perhaps to 10,000 feet and then rolls away to the northeast" (Lyons).

Rainfall.—It will thus be seen that as to rainfall the islands have a great variety of climates. While some regions are almost rainless, others are deluged; and still others, like Honolulu, the chief place of resort, have a moderate rainfall only—the showers of an English April with the temperature of an Italian June.

The rapid discharge of the rainfall on the eastern coast of Hawaii is a sight to behold. I have stood upon the bank of a deep canon in the Hilo district, while the heavy rain-pour was deluging the slopes of Mauna Kea. Far below, a pure mountain stream, easily fordable by leaping from one lava rock to another, was foaming seaward. Presently the noise of unloosed waters came from the mountain side, growing momentarily louder, and soon the torrent, yellow and turbid, came thundering down the rocky valley, with no less force and fury than if a great dam had broken in the mountains; suddenly the little stream was magnified into a roaring and impassable torrent, a hundred times the volume of a few moments before. For days afterwards, and for miles around, the sea would be discolored by the turbid discharge, and the floating drift-wood came ashore at distant points along the coast.

The accompanying maps of the individual islands, figs. 2 to 5 inclusive, show the location of the places mentioned in this article they also give the location and elevation of most of the stations for which data are published in the rainfall table furnished monthly by Mr. Lyons. A study of these tables in connection with the maps will prove most interesting. Mr. Lyons promises us a detailed study of the rainfall of the Honolulu district in the near future.—H. H. K.

ALASKAN METEOROLOGICAL DATA.

The following interesting climatological data regarding St. Michaels Bay were obtained from the records of the Alaskan Commercial Company by Dr. James T. White of the United States Revenue-Cutter Service.

Statement showing dates of final freezing and departure of the ice in St. Michaels Bay, of the coldest day, and of the first arrival of steamers from the Yukon and from outside in each year from 1874 to 1900.

Year.	Bay closed.	Coldest day.	Bay opened.	First arrival from sea.	First from Yukon River.
1874	Dec. 3	Jan. 1, -28	May 25		
1875	Nov. 20	Feb. 15, -28	June 8		
1876	Nov. 6	Feb. 19, -46	June 8		
1877	Nov. 15	Feb. 7, -41	June 13	June 19	June 22
1878	Nov. 15	Feb. 17, -22	June 15	June 25	Sept. 21
1879	Nov. 9	Jan. 4, -36	June 9	June 22	Sept. 5
1880	Dec. 6	Feb. 17, -43	June 27	June 20	
1881	Dec. 7	Feb. 12, -35	June 11	June 14	June 19
1882	Nov. 25	Dec. 10, -24	June 9	June 24	June 17
1883	Nov. 21	Jan. 24, -35	June 8	June 22	June 10
1884	Oct. 10	Feb. 21, -43	June 10	June 7	June 17
1885	Nov. 5	Dec. 29, -33	June 30	June 24	Aug. 27
1886	Nov. 13	Jan. 20, -32	June 5	June 20	June 24
1887	Nov. 2	Jan. 30, -40	June 14	June 20	June 15
1888	Nov. 18	Nov. 28, -20	June 8	June 25	June 8
1889	Nov. 16	Mar. 8, -29	June 23	July 4	June 13
1890	Nov. 11	Jan. 26, -40	June 5	July 13	June 6
1891	Nov. 14	Jan. 30, -30	June 9	June 29	June 7
1892	Nov. 7	Jan. 21, -26	June 11	June 18	June 7
1893	Nov. 5	Feb. 4, -38	June 10	June 21	June 14
1894	Nov. 1	Jan. 14, -36	June 23	June 25	June 18
1895	Dec. 7	Feb. 15, -48	June 18	June 29	June 19
1896	Nov. 21	Mar. 23, -40	June 25	July 7	June 27
1897	Oct. 25	Feb. 19, -31	June 22	July 26	June 22
1898	Oct. 31	Mar. 1, -37	June 13	June 18	June 23
1899	Nov. 7	Jan. 21, -35	June 10	July 17	June 16
1900	Nov. 22		June 8	June 12	June 9
1901	Nov. 2	Jan. 13, -32 Jan. 29, -32	July 3		

Dr. White has also forwarded a copy of the meteorological observations made at St. Michaels under his direction, and other information of interest from July 1, 1900, to June 30, 1902, inclusive, and they will be published from time to time in the MONTHLY WEATHER REVIEW.—H. H. K.